

Calc I Test Review answers

Int, u-du, PVA

$$\textcircled{1} \int (3x^4 - 7x^2 + 5) dx$$

$$\boxed{\frac{3}{5}x^5 - \frac{7}{3}x^3 + 5x + C}$$

$$\textcircled{2} \int 4x^3 (10x^4 - 1)^{1/3} dx$$

$$u = 10x^4 - 1$$

$$du = 40x^3 dx$$

$$dx = \frac{du}{40x^3}$$

$$\textcircled{3} \int 2x \sin(3x^2) dx$$

$$u = 3x^2$$

$$du = 6x dx$$

$$dx = \frac{du}{6x}$$

$$\int \cancel{2x} \sin(u) \frac{du}{\cancel{6x}}$$

$$\frac{2}{6} \int \sin(u) du$$

$$\frac{1}{3} [-\cos(u)] + C$$

$$-\frac{1}{3} \cos(3x^2) + C$$

$$\int \cancel{4x^3} u^{1/3} \frac{du}{\cancel{40x^3}}$$

$$\frac{1}{10} \int u^{1/3} du$$

$$\frac{1}{10} \left[\frac{3}{4} u^{4/3} \right] + C$$

$$\frac{3}{40} u^{4/3} + C$$

$$\boxed{\frac{3}{4} (10x^4 - 1)^{4/3} + C}$$

$$\textcircled{4} \int (6x^2 - 4 \cos(x)) dx$$

$$2x^3 - 4 \sin(x) + C$$

$$\textcircled{5} \int \frac{5x^{7/3} + 4x^2}{6x^{2/3}} dx = \int \left(\frac{5}{6} x^{5/3} + \frac{2}{3} x^{4/3} \right) dx$$

$$\frac{5}{16} x^{8/3} + \frac{2}{7} x^{7/3} + C$$

$$\textcircled{6} \int \frac{3x^{3/2} - 8x^{3/2}}{2x^3} dx = \int \frac{-5x^{3/2}}{2x^3} dx = \int -\frac{5}{2} x^{-3/2} dx$$

$$-\frac{5}{2} \left[-2x^{-1/2} \right] + C = 5x^{-1/2} + C$$

$$\textcircled{7} \int \left(\frac{4}{3} x^{3/4} - 2 \sin(x) \right) dx$$

$$\frac{16}{21} x^{7/4} + 2 \cos(x) + C$$

$$\textcircled{8} \int -2 \sin^3(x) \cos(x) dx$$

$$u = \sin(x)$$

$$du = \cos(x) dx$$

$$dx = \frac{du}{\cos(x)}$$

$$\int -2 u^3 \cancel{\cos(x)} \frac{du}{\cancel{\cos(x)}}$$

$$-2 \int u^3 du$$

$$-2 \left[\frac{1}{4} u^4 \right] + C$$

$$\boxed{-\frac{1}{2} \sin^4(x) + C}$$

$$\textcircled{9} \int \underbrace{2x^2 (4x^3 - 7)^5}_{u = 4x^3 - 7} + \sin(x) dx$$

$$u = 4x^3 - 7 \quad du = 12x^2 dx$$

$$dx = \frac{du}{12x^2}$$

$$\int \cancel{2x^2} u^5 \frac{du}{\cancel{12x^2}} + \int \sin(x) dx$$

$$\frac{1}{6} \int u^5 du + \int \sin(x) dx$$

$$\frac{1}{36} u^6 - \cos(x) + C$$

$$\boxed{\frac{1}{36} (4x^3 - 7)^6 - \cos(x) + C}$$

$$\textcircled{10} \int (x^3 - 1) (x^4 - 4x)^{\frac{1}{2}} dx$$

$$u = x^4 - 4x \quad du = (4x^3 - 4) dx \quad dx = \frac{du}{4x^3 - 4}$$

$$\int (x^3 - 1) u^{\frac{1}{2}} \frac{du}{4x^3 - 4} = \int \cancel{(x^3 - 1)} u^{\frac{1}{2}} \frac{du}{4 \cancel{(x^3 - 1)}}$$

$$\frac{1}{4} \int u^{\frac{1}{2}} du = \frac{1}{4} \left(\frac{2}{\frac{3}{2}} u^{\frac{3}{2}} \right) + C = \boxed{\frac{1}{6} (x^4 - 4x)^{\frac{3}{2}} + C}$$

⑪ $a(t) = -32$

a) $v(t) = \int a(t) dt = -32t + C$

$$-14.5 = -32(1) + C$$

$$C = 17.5$$

$$v(t) = -32t + 17.5$$

$$s(t) = \int v(t) dt = -16t^2 + 17.5t + C$$

$$58.5 = -16(3)^2 + 17.5(3) + C$$

$$C = 150$$

$$s(t) = -16t^2 + 17.5t + 150$$

b) $v(0) = 17.5 \text{ ft/sec}$

$$s(0) = 150 \text{ ft}$$

c) $v(t) = 0$
 $t = .547 \text{ sec}$

d) $s(t) = 0$
 $t = 3.657 \text{ sec}$

$$v(3.657) = -99.524 \text{ ft/sec}$$

e) Displacement:

$$s(0) = 150$$

$$s(3.657) = 0$$

$$150 - 0 =$$

$$150 \text{ ft}$$

Total Dist:

$$s(0) = 150$$

$$s(.547) = 154.785$$

$$s(3.657) = 0$$

$$\left. \begin{array}{l} 150 \\ 154.785 \end{array} \right\} 4.785$$

$$\left. \begin{array}{l} 154.785 \\ 0 \end{array} \right\} 154.785$$

$$159.57 \text{ ft}$$

$$\textcircled{12} \quad a(t) = 12t^2 - 12t + 2$$

$$a) \quad v(t) = \int a(t) dt = 4t^3 - 6t^2 + 2t + C$$

$$-2 = 4(1)^3 - 6(1)^2 + 2(1) + C$$

$$C = -2$$

$$v(t) = 4t^3 - 6t^2 + 2t - 2$$

$$s(t) = \int v(t) dt = t^4 - 2t^3 + t^2 - 2t + C$$

$$34 = 3^4 - 2(3)^3 + 3^2 - 2(3) + C$$

$$C = 4$$

$$s(t) = t^4 - 2t^3 + t^2 - 2t + 4$$

$$b) \quad v(0) = -2$$

$$s(0) = 4$$

$$c) \quad v(t) = 0$$

$$t = 1.398 \text{ sec}$$

$$s(1.398) = 1.514 \text{ ft}$$

$$d) \quad a(2.5) = 47 \text{ ft/sec}^2$$

$$v(2.5) = 28 \text{ ft/sec}$$

$$s(2.5) = 13.0625 \text{ ft}$$

e) Displacement:

$$s(0) = 4$$

$$s(4) = 140$$

$$\left. \begin{array}{l} s(0) = 4 \\ s(4) = 140 \end{array} \right\} 136 \text{ ft}$$

Total dist:

$$s(0) = 4$$

$$s(1.398) = 1.514$$

$$s(4) = 140$$

$$\left. \begin{array}{l} s(0) = 4 \\ s(1.398) = 1.514 \end{array} \right\} 2.486$$

$$\left. \begin{array}{l} s(1.398) = 1.514 \\ s(4) = 140 \end{array} \right\} 138.486$$

$$140.972 \text{ ft}$$